Knowledge Sharing and Service Innovation in Academic Libraries

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Abstract: Innovation is becoming a survival strategy for academic libraries, which strive to preserve their relevance and contribution. Knowledge sharing (KS) is believed to be an important factor in creating innovative capabilities and improving innovation. Yet, only scant empirical research has investigated the possible effect of KS on service innovation (SEI). This study adopted a research model to analyze the effect of KS on SEI as well as the mediating effects of information technology innovation (ITI) and management innovation (MIN) on the relationship between KS and SEI. The results are derived using a data set from two large academic libraries in Egypt. Although KS has a significant total effect on SEI, its role in augmenting SEI is only secondary since it depends mainly on the mediating roles of ITI and MIN. These results are interesting because they deviate from the assumptions and results of many previous studies on KS and SEI.

Keywords: Service innovation, Knowledge sharing, IT innovation, Management innovation, Academic libraries

1. Introduction

Academic libraries have recently experienced immense pressure to maintain their value and service to user communities (Brundy, 2015; Yeh and Walter, 2017). With the emergence of numerous information technology (IT)-related innovations, the transition to digital services, and increased demands for new services, users have been abandoning academic libraries (Islam, Agarwal, and Ikeda, 2017). Hence, academic libraries consider service innovation (SEI) a strategic imperative for sustaining value and transforming their service in the emerging digital environment (Li, 2006; Islam, Agarwal, and Ikeda, 2017; Goddard, 2020).

However, the extant literature recommends knowledge sharing (KS) as an important factor influencing innovation capabilities and innovation performance (e.g., Darroch and McNaughton, 2002; Kaewchur, Anussornnitisarn, and Pastuszak, 2013; Pacios, 2020). KS presumably increases accessibility to new knowledge, improves decision-making, and augments innovation capability (Nonaka, Von Krogh, and Voelpel, 2006). Yet, research on innovation in academic libraries is scattered (Brundy, 2015), and quantitative studies investigating KS and innovation services in libraries are limited (Islam, Agarwal, and Ikeda, 2017).

This study proposes that KS may not necessarily improve SEI if it doesn't simultaneously improve IT innovation (ITI) and management innovation (MIN) (Darroch and McNaughton, 2002). It adopts a research model to hypothesize and test the mediating effect of ITI and MIN on the relationship between KS and SEI in academic libraries. The results of this research will provide empirical evidence that contributes to the growing body of knowledge on KS and innovation and help academic library leaders chart directions for improving service innovation (Brundy, 2015).

2. Theoretical Background

Damanpour and Aravind (2012) classify innovation into technical and non-technical categories. The non-technical innovation includes the overlapping MIN and administrative innovations (Birkinshaw, Hamel, and Mol, 2008; Khosravi, Newton, and Rezvani, 2019). Technical innovation refers to product, service, or process innovations (Walker, Damanpour, and Devece, 2011; Damanpour, 2014). In this study, ITI is considered a technological innovation, which denotes the adoption of advanced information technologies and systems to significantly improve organizational processes, management practice (e.g., MIN), and organizational outcomes (e.g., SEI). Innovation, particularly SEI, is central for academic libraries to continuously grow and survive (Li, 2006; Vaughan, 2013; Brundy, 2015; Islam, Agarwal, and Ikeda, 2017; Yeh and Walter, 2017). SEI in academic libraries may include changing the existing library service programs in response to the changing needs of users, introducing new IT-enabled service programs, and presenting new services that support new paradigms of teaching and research (Walter and Lankes, 2015).

KS is viewed as the process of transferring experience and organizational knowledge to business processes through communication channels between individuals (Oyemomi, Neaga, and Alkhuraiji, 2016). KS is an essential process for innovation. Through KS, employees can mutually exchange their knowledge and contribute to innovation (Ye, Liu, and Tan, 2021). Besides, through interaction, modification, and common consensus, an idea

or concept transforms into a different innovative idea, and the knowledge grows in a spiral cycle that helps boost innovation performance (Wang et al, 2021). Academic librarians could generate creative and implementable SEI ideas based on organizational knowledge and knowledge from direct user contact. Although KS is assumed to play a significant role in SEI generation and improvement, we argue that this role could be augmented and mediated by ITI and MI.

ITI includes the creation or use of new technologies to facilitate and provide services to customers (De Vries, Bekkers, and Tummers, 2016). The service innovation capability of a library depends on its employees' and users' knowledge and skills, culture, IT adoption, and routines for new service development (Islam, Agarwal, and Ikeda, 2017). The innovative use of IT capabilities could, and has, transformed library services from traditional services (e.g., card catalogs, printed books and periodicals, bibliographic instruction, in-person, or face-to-face reference) to new services and delivery modes such as electronic collections (e.g., e-books, e-journals, and databases), virtual reference services, and other online services. Academic libraries need to continue exploiting new IT systems to offer services in innovative ways to meet the changing needs of users (Moyo, 2004).

MIN denotes the development and use of new approaches for performing the work of management, new organizational strategy and structure, and new processes that produce changes in the organization's managerial procedures and administrative systems (e.g., Birkinshaw, Hamel, and Mol, 2008; Damanpour and Aravind, 2012; Damanpour, 2014; De Vries, Bekkers, and Tummers, 2016). MIN presents a distinct departure from traditional management principles, processes, and practices to the establishment of new management practices intended to enhance organizational performance (Mol and Birkinshaw, 2009). To facilitate SEI, managers should be innovative leaders who foster an innovation-supportive culture, tie performance evaluations and rewards to innovation outcomes, and create dedicated innovation teams with high levels of decision-making autonomy (Yeh and Walter, 2017).

3. Research Model and Hypotheses
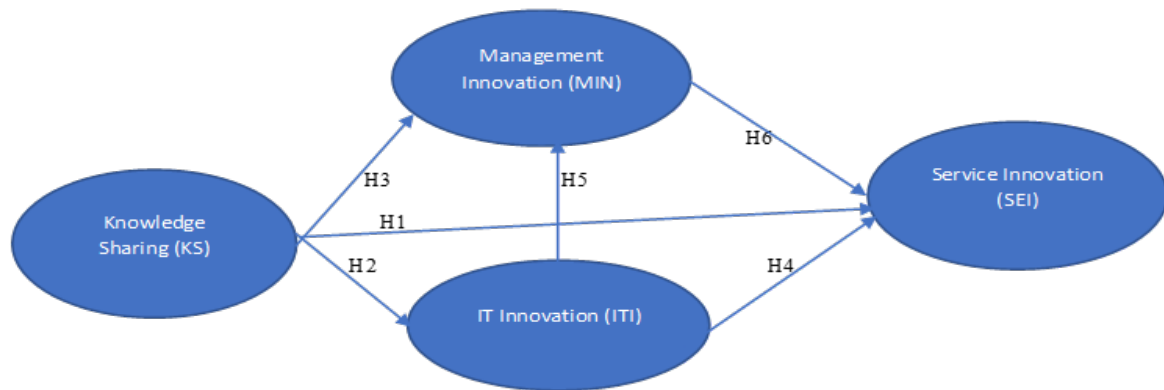
3.1 Research Model

Figure 1: The Research Model

Figure 1 depicts the research model. The model has been constructed based on our review of the relevant literature. The model examines the possible influence of KS on SEI and evaluates the mediating roles of MIN and ITI in the relationship between KS and SEI.

3.2 Research Hypotheses

3.2.1 Knowledge sharing (KS) influence

The extant literature suggests a strong link between KS and innovation performance in organizations (e.g., Kamaşak and Bulutlar, 2010; Wang and Wang, 2012; Saenz, Aramburu, and Blanco, 2012; Kaewchur, Anussornnitisarn, and Pastuszak, 2013; Podrug, Filipovic, and Kovac, 2017; Pacios, 2020; Goddard, 2020). As such, innovation depends on KS (Castaneda and Cuellar, 2020). Although the results of the scanty research on the relationship between KS and SEI in academic libraries are inconclusive (e.g., Islam, Agarwal, and Ikeda, 2017), we predict KS will influence SEI in the investigated academic libraries.

H1: Knowledge sharing (KS) has a positive effect on service innovation (SEI).

Numerous studies (e.g., Davison, Ou, and Martinsons, 2013; Witherspoon et al, 2013; Norek, 2013; Ibrahim, Mohamad, and Shah, 2020; Yepes and López, 2023) report assumptions and results in support of a directional relationship from IT to KS. However, we propose that KS is a likely antecedent of ITI. Since KS is a social and organizational process, it arguably influences ITI. A fitting human resources practice in an organization could create a commitment-based environment and establish an appropriate organizational social climate (Nahapiet and Ghoshal, 1998), which motivates employees to work together and share knowledge. This, in turn, may drive the need to adopt a contemporary IT infrastructure to facilitate KS (Collins and Smith, 2006). Although the literature is short on empirical evidence on the effect of KS on ITI, we propose that KS will influence ITI.

H2: Knowledge sharing (KS) has a positive effect on IT innovation (ITI).

Mol and Birkinshaw (2009) underline the importance of knowledge sources as stimuli for the introduction of new management practices. In addition, resource-based and knowledge-based views claim that organizations with large stocks of resources and knowledge are more likely to successfully introduce new MIN (Mol and Birkinshaw, 2009). Also, knowledge management (KM), which aims to acquire, share, use, and develop knowledge (Chang and Lee, 2008), and organizational learning, which allows the development, acquisition, and transformation of knowledge, should help develop novel ideas for management practice (Camisón and Villar-López, 2011; de Souza Bermejo et al, 2015; Khosravi, Newton, and Rezvani, 2019). Hence, we predict that KS will influence MIN in the investigated academic libraries.

H3: Knowledge sharing (KS) has a positive effect on management innovation (MIN).

3.2.2 IT innovation (ITI) influence

Effective utilization of ITI (e.g., communication infrastructures, groupware, e-mail, document management, data warehousing, workflow software, decision support systems, portal sites, social networks, on-line knowledge sharing, and discussion support systems) enables employees to interact and share knowledge and information, which could in turn influence service or product innovation (e.g., Pérez-González, Trigueros-Preciado, and Popa, 2017; Islam, Agarwal, and Ikeda, 2017). Also, information synergy and IT capability can enhance an organization's capacity to generate new ideas and improve organizational performance (Kaewchur, Anussornnitisarn, and Pastuszak, 2013). Hence, we predict that ITI will influence SEI in the investigated libraries.

H4: IT innovation (ITI) has a positive effect on service innovation (SEI).

The introduction of new IT and new information systems for management purposes is an important dimension of MIN (e.g., Walker, R. M., Damanpour, F., and Devece, 2011; Hecker and Ganter, 2013; Kraśnicka, Głód, and Wronka, 2016) and a source for innovation (Borins, 2001). In addition, Hecker and Ganter (2013) believe that KS and organizational practices evolving from the use of modern IT are important elements of MIN. Similarly, Černe, Jaklič, and Škerlavaj (2013) denote that KS improves MIN by utilizing IT systems to facilitate information and knowledge flow. Therefore, we predict that ITI will influence MIN in the investigated libraries.

H5: IT innovation (ITI) has a positive effect on management innovation (MIN).

3.2.3 Management innovation (MIN) influence

MIN practice provides valued working practices and organizational flexibility that could expand the ability to adopt new processes or technological innovations (e.g., products and services) (Le Bas, Mothe, and Nguyen-Thi, 2015; Kraśnicka, Głód, and Wronka, 2016; Khosravi, Newton, and Rezvani, 2019). Moreover, innovative managers can inspire their employees to be innovative and to search for new ideas, products, services, or processes (Mol and Birkinshaw, 2009; Cavagnoli, 2011; Hollen, Van Den Bosch, and Volberda, 2013). Yet, empirical studies on the relationship between MIN and SEI are sparse (Khosravi, Newton, and Rezvani, 2019). We propose that MIN will influence SEI in the investigated libraries.

H6: Management innovation (MIN) has a positive effect on service innovation (SEI).

4. Research Method

4.1 Measurement

The constructs in the research model were operationalized and measured using multi-item reflective measures, based on measures previously used in the relevant literature (e.g., Yu et al., 2010; Walker et al., 2011; Islam et al. 2017; Awais and Ameen, 2019; Gunjal, 2017)) and revised as necessary. The measuring scales include KS (10

items), ITI (9 items), MIN (8 items), and SEI (10 items). Examples of KS items are "I share my knowledge and service-related lessons learned with my colleagues across the library" and "I share my knowledge on users' needs and ideas for service improvement with my colleagues through conversations and dialogues." Examples of ITI items are "The library provides links to full-text search results through its online catalog" and "The library has a technical support staff that helps initiate and provide first-rate services." Examples of MIN items are "The library management adjusts its organizational structures on a regular basis" and "The library administration occasionally changes policies to enhance library services." And examples of SEI include "The library offers new services as a result of users' needs analysis" and "The library innovates new services and programs through knowledge sharing among its staff." All items were measured using five-point scales, ranging from "1" (strongly disagree) to "5" (strongly agree).

4.2 Population and Sample

The population for this research includes only the librarians who are directly involved in providing library service in the academic library at Cairo University (110 employees) and the academic library at American University (89 employees). A survey was developed to collect the data using a non-probability convenience sample. A total of 105 complete responses were collected (55 responses from Cairo University and 50 responses from the American University), with a response rate of 52.7%.

4.3 Sample Profile

The female informants in the sample are 50.5% (n = 53), and 90.5% of the informants hold bachelor's or higher degrees. In addition, 42.9% have degrees in library and information sciences, 27.6% are managers, and 53.3% have at least 15 years of experience.

5. Analysis and Results

We first performed a preliminary evaluation of the measurement model via a confirmatory factor analysis to describe relationships between hidden variables of the model (Wu et al, 2016) and to verify the reliability and convergent validity of the constructs. Table 1 summarizes the resultant measurement model. Notably, some items have been excluded to enhance the reliability of the measurement model. In addition, the SEI construct analysis reveals the emergence of two factors: 'personalized service innovation' (PSI) and 'web-enabled service innovation' (WSI). The results suggest that, aside from WSI, all constructs in the model have adequate reliability ($\alpha \geq 0.70$), convergent validity (AVE ≥ 0.50), and factor loadings (≥ 0.60; Hair, Barry, and Rolph, 2010).

Table 1. The Confirmatory Factor Analysis Results

Dimensions	Factor Loading	Reliability Coefficient (α)	Average Variance Explained (AVE)
Knowledge Sharing (KS)		0.800	0.636
KS2	.772		
KS3	.786		
KS4	.766		
KS7	.661		
Management Innovation (MIN)		0.912	0.742
MIN3	.821		
MIN4	.724		
MIN5	.812		
MIN7	.701		
MIN8	.807		
IT Innovation (ITI)		0.865	0.656
ITI3	.625		
ITI4	.639		
ITI5	.787		

Dimensions	Factor Loading	Reliability Coefficient (α)	Average Variance Explained (AVE)
ITI6	.706		
ITI7	.682		
Personalized Service Innovation (PSI)		0.807	0.640
SEI1	.721		
SEI2	.748		
SEI4	.627		
SEI5	.638		
Web-Enabled Service Innovation (WSI)		0.677	0.608
SEI7	.645		
SEI8	.731		
SEI9	.751		
OVERALL MODEL		0.926	0.691

We revised the research model and hypotheses to reflect the results of the confirmatory factor analysis. Table 2 displays the original and revised research hypotheses.

Table 2: The Original and Revised Research Hypotheses

Original Hypotheses	Revised Hypotheses
H1: Knowledge sharing (KS) has a positive effect on service innovation (SEI).	H1a: Knowledge sharing (KS) has a positive effect on personalized service innovation (PSI). H1b: Knowledge sharing (KS) has a positive effect on web-enabled service innovation (WSI).
H4: IT innovation (ITI) has a positive effect on service innovation (SEI).	H4a: IT innovation (ITI) has a positive effect on personalized service innovation (PSI). H4b: IT innovation (ITI) has a positive effect on web-enabled service innovation (WSI).
H6: Management innovation (MIN) has a positive effect on service innovation (SEI).	H6a: Management innovation (MIN) has a positive effect on personalized service innovation (PSI). H6b: Management innovation (MIN) has a positive effect on web-enabled service innovation (WSI).

Table 3 provides descriptive statistics for the research variables. Overall, and based on the means and the related p-values, the respondents agree that they share significant knowledge and experience with colleagues, their libraries adopt various ITI innovations, their administrators adopt diverse forms of managerial innovations, and their libraries provide user communities with both innovative personalized service (PSI) and innovative web-enabled service (WSI).

Next, we used the Partial Least Squares Sequential Structural Modeling (PLS-SEM) method to further verify the measurement model fit, evaluate a predictive model for the data set, and test the research hypotheses. Hence, we utilized the Smart PLS 4.0 software, and the bootstrapping method run by 5,000 subsamples (Sarstedt et al, 2016) to assess both the measurement and structural models.

Table 3: Descriptive Statistics

	Min	Max	Mean	Std. Dev	t-Value	P-Value
KS	1.00	5.00	3.9281	.64014	14.856	<.001
MIN	1.00	5.00	3.6935	.80901	8.783	<.001
ITI	2.60	5.00	4.2079	.63893	19.373	<.001
PSI	2.01	5.03	3.9193	.67606	13.934	<.001
WSI	1.61	5.00	4.0529	.63537	16.981	<.001

Note: The difference from 3 (the midpoint of the scale) is significant at p ≤ 0.05.

5.1 Assessment of the Measurement Model

The measurement model assessment further verifies the reliability and validity of the constructs. The assessment entails examining the internal consistency, reliability, convergent validity, and discriminant validity of the adapted measures (Marcoulides and Saunders, 2006). Table 4 summarizes the results. Except for WSI, all alpha coefficients fall within the recommended range (0.70–0.95; Hair et al, 2019). Also, each construct explains greater than 50% of the indicator's variance, thus providing acceptable item reliability (Hair et al, 2019; Sarstedt, Ringle, and Hair, 2021). All composite reliability coefficients are well above the recommended threshold (≥ 0.50; Hair et al, 2019), which demonstrates the reliability of the adapted measures. We also assessed the convergence validity of the measurement model by examining the AVE values, and all AVEs are above the recommended threshold (≥ 0.50; Hair et al, 2019). We finally assessed the discriminant validity of the measures following Fornell and Larcker's (1981) criterion. The results indicate the existence of discriminant validity since the square root of the latent variables' AVEs is greater than the correlation that each construct has with the other constructs.

Table 4: Construct Reliability and Validity

Constructs	Cronbach's Alpha (α)	Composite Reliability	Average Variance Extracted (AVE)
KS	0.808	0.815	0.636
MIN	0.913	0.915	0.741
ITI	0.868	0.875	0.655
PSI	0.812	0.818	0.640
WSI	0.677	0.708	0.606

5.2 Assessment of the Structural Model

We adopted procedures that have been specifically designed to assess the adequacy of the prediction-oriented PLS-SEM models (Shmueli et al, 2016) to assess the structural model. Figure 2 depicts the consequential model, which shows the direct effects of the different paths. The R^2 values for the two endogenous variables in the model (PSI and WSI) are 0.468 and 0.367, respectively. These results suggest that the model has moderate explanatory power as well as a modest predictive relevance (Hair, Barry, and Rolph, 2010). In addition, since the SRMR index is 0.078 (< 0.08), the model is adequately fitted, although the NFI index (0.726) is relatively lower than the recommended threshold (≥ 0.90; Henseler, Hubona, and Ray, 2016).

5.3 Testing the Hypotheses

Table 5 depicts the causal relationships (paths) between the exogenous and endogenous variables in the structural model, along with It also shows the total path coefficients, t-values, and p-values. The total path coefficients, which determine the magnitude of the direct and indirect effects that the exogenous variables have on the endogenous variables, are used to test the revised research hypotheses. Although KS has non-significant direct effects on PSI and WSI, its significant total indirect positive effects make its total positive effects on PSI and WSI significant. KS also has significant positive effects on ITI and MIN. In addition, ITI has significant positive effects on PSI and MIN. MIN, however, has a significant positive effect on PSI and a non-significant positive effect on WSI. These results support the acceptance of all hypotheses except H6b.
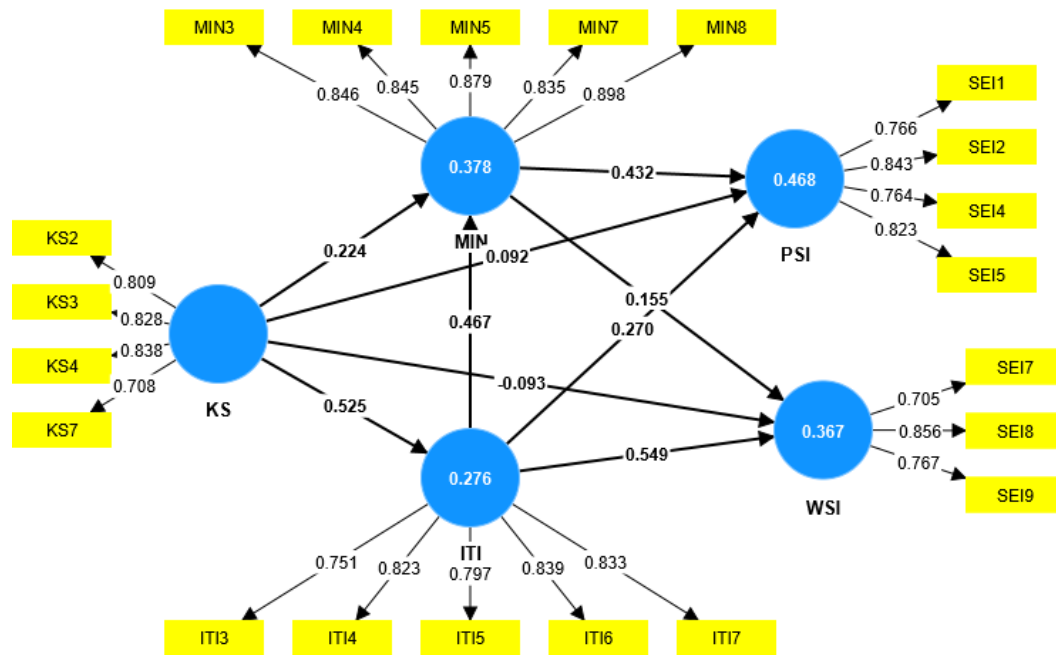
Figure 2: The Consequential Model

Table 5: Path Coefficients

Paths	Path Coefficient	t-Value	P-Value	Significance*	Hypothesis
Total Effects:					
KS -> PSI	0.437	4.235	0.000	S	H1a
KS -> WSI	0.268	2.4	0.016	S	H1b
KS -> ITI	0.525	6.076	0.000	S	H2
KS -> MIN	0.469	4.542	0.000	S	H3
ITI -> PSI	0.472	5.133	0.000	S	H4a
ITI -> WSI	0.622	5.818	0.000	S	H4b
ITI -> MIN	0.467	5.029	0.000	S	H5
MIN -> PSI	0.432	4.341	0.000	S	H6a
MIN -> WSI	0.155	1.387	0.166	NS	H6b

* S = Significant, NS = Not Significant

6. Discussion

Our results disclose that the investigated libraries provide noteworthy innovative services (SEI) to their user communities. More specifically, they offer personalized service innovation (PSI) and web-enabled service innovation (WSI). The PSI includes new services and programs (e.g., digital publishing for various information sources, seminars, and workshops on online and library search, etc.) for different user groups based on the analysis of users' needs and the sharing of knowledge among staff members. The WSI includes IT-enabled services made available to users via the web (e.g., service to scientific research projects, use of RSS to inform users about new collections, reservation of library resources and collections, inter-library loan service, etc.). In addition, the results demonstrate that KS, MIN, and ITI are important drivers of the two types of service innovation (PSI and WSI). Collectively, KS, MIN, and ITI explain 47% and 37% of the variances in PSI and WSI, respectively. Subsequently, our research model has moderate explanatory power and modest predictive relevance.

Notably, the employees in the investigated libraries reportedly share personal and organizational knowledge via different communication channels; and KS has significant total effects on PSI and WSI, although the direct effects

of KS on these two types of service innovation are insignificant. In particular, the significant total indirect effect KS has on PSI occurs through the significant indirect specific effects of the KS-ITI-PSI and KS-ITI-MIN-PSI paths, and the significant total indirect effect that KS has on WSI occurs through the significant indirect specific effect of the KS-ITI-WSI path. Compared to MIN, ITI plays a stronger mediating role between KS and service innovation (i.e., PSI and WSI).

These results, however, challenge the assumption of the existence of a direct relationship between KS and organizational performance (e.g., SEI) reported in numerous previous studies. They confirm that KS plays only a supporting role in generating service innovation. Sharing knowledge and experience among employees improves service innovation only when it brings about improvements in other innovation areas such as MIN and ITI practices. This supporting role of KS in stimulating service innovation substantiates Darroch and McNaughton's (2002) conclusion that KS provides only indirect support for innovation.

7. Implications

The results of this study have both theoretical and practical implications. As to the theoretical implications, this study supplements the scanty empirical research on innovation, particularly in service organizations. Its empirical results contribute to the growing body of knowledge on innovation management and its influencing factors in academic libraries. Although KS has been recognized in the literature as a significant contributor to product/service innovation development, it is important to recognize that the role of KS is only secondary and is contingent on whether it simultaneously contributes to the development of other innovations (e.g., ITI and MIN) in an organization. This is an intriguing result since it departs from the assumptions and results of previous studies on KS and SEI. In addition, innovations (e.g., ITI, MIN, and SEI) are seemingly interrelated, and the relationships among innovation types are likely bi-directional. Researchers may therefore further investigate and verify the assumed two-way relationships among innovation types and between innovation types and KS in different settings.

Libraries need to develop innovation strategies bearing in mind that innovations (e.g., managerial, IT, service, process, social, etc.) are interrelated. If they seek to improve service innovation to meet the demands of their users, they should simultaneously promote their management and IT innovations and encourage their employees to share more knowledge. Hence, the innovation strategy for a library should guide the preparation and execution of plans designed to develop an innovation portfolio suitable to the library's mission and objectives. The plans should be backed up with the requisite human resources and IT infrastructure (Vaughan, 2013). Senior managers should manage the human resources allocation and training processes to create a team of "movers and shakers" (Yeh and Walter, 2017). Senior managers should manage the human resources allocation and training processes to create a team of "movers and shakers" (Yeh and Walter, 2017), who willingly share knowledge and experience among themselves and with users.

8. Conclusions

Knowledge sharing (KS) is viewed as an important factor in creating innovative capabilities and improving innovation (Kaewchur, Anussornnitisarn, and Pastuszak, 2013; Pacios, 2020). Yet, quantitative studies investigating KS and service innovation (SEI) in academic libraries are limited (Brundy, 2015; Islam, Agarwal, and Ikeda, 2017), and information on the possible interdependence of the different types of innovations and their potential effect on SEI is deficient. This study provides empirical evidence on the effect of KS on SEI as well as the mediating effect of management innovation (MIN) and IT innovation (ITI) on the relation between KS and SEI in the investigated academic libraries. The results imply that KS plays only a secondary role in influencing SEI, and the mediating roles of MIN and ITI are essential for KS to spawn SEI. These results, however, should be interpreted considering their limitations, as they are derived from perceptual, cross-sectional data drawn from two Egyptian academic libraries. Particularly, the generalizability of these results may be challenged by potential cultural and policy differences across libraries and nations.

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